CLAIMS:

1. A unit (100, 101, 200, 201, 301) comprising:

n ($n \geq 1$) integrators ($I_{1...n}$) in series, a first of the n integrators ($I_{1...n}$) receiving an input signal;

at least one device (Q), which acts as a quantizer when an absolute value of a signal input thereto is smaller and as a gain element when the absolute value of the signal input thereto is larger; and

a device (12) for quantizing an output of the unit (100, 101, 200, 201, 301).

2. The unit (100, 101 200, 201, 301) of claim 1, wherein the at least one device acts as a gain device, with or without an offset.

3. The unit (100) of claim 2, wherein the signal input to the at least one device (Q_1) is an output of the integrator (I_n) and the output of the at least one device (Q_1) is input to the device 12 and as weighted feedback paths to the n integrators ($I_{1...n}$).

4. The unit (100) of claim 2, wherein the signal input to the at least one device (Q_1) is an output of the integrator (I_n) and the output of the integrator (I_n) is input to the device (12), and the output of the at least one device (Q_1) is input to the weighted feedback paths to the n integrators ($I_{1...n}$).

5. The unit (101) of claim 2, wherein the signals output from the n integrators $I_{1...n}$ are weighted and summed and the summed output is input to the at least one device (Q_1,) an output of the at least one device (Q_1) is input to the device (12) and to integrator (I_1).

6. The unit (101) of claim 2, wherein the signals output from the n integrators ($I_{1...n}$) are weighted and summed and the summed output is input to the at least one device (Q_1) and the device (12), and an output of the at least one device (Q_1) is input to the integrator (I_1).

7. The unit (200) of claim 2, wherein the signal input to the at least one device ($Q_{1...m}$) where $m \leq n$, is an output of the integrator (I_n), the outputs of the at least one device ($Q_{1...m}$) is input as weighted feedback paths to one or more of the n integrators ($I_{1...n}$) and an output of the integrator (I_n) is input to the device (12).

8. The unit (200) of claim 2, wherein the signal input to the at least one device ($Q_{1...m}$), is an output of the integrator (I_n), the outputs of the at least one device ($Q_{1...m}$) is input as weighted feedback paths to one or more of the n integrators ($I_{1...n}$) and the output of any of the at least one devices ($Q_{1...m}$) is input to device (12).

9. The unit (201) of claim 2, wherein the signals output from the n integrators ($I_{1...n}$) are weighted and summed, the summed output is input to the at least one device ($Q_{1...m}$) outputs of the at least one device ($Q_{1...m}$) is input to one or more of the n integrators ($I_{1...n}$), and an output of one of the at least one device ($Q_{1..m}$) is input to the device (12).

10. The unit (201) of claim 2, wherein the signals output from the n integrators ($I_{1...n}$) are weighted and summed, the summed output is input to the at least one device ($Q_{1...m}$), outputs of the at least one device ($Q_{1...m}$) are input to one or more of the n integrators ($I_{1...n}$), and the summer (13) output is input to the device (12).

11. The unit (301) of claim 2, wherein the signals output from the n integrators ($I_{1...n}$) are weighted and summed, the summed output is input to the at least one device ($Q_{1...m}$) and the device (12), and outputs of the at least one device ($Q_{1...m}$) is input to one or more of the n integrators ($I_{1...n}$).

12. The unit (301) of claim 2, wherein the signals output from the n integrators ($I_{1...n}$) are weighted and summed, the summed output is input to the at least one device ($Q_{1...m}$), and outputs of the at least one device ($Q_{1...m}$) are input to one or more of the n integrators ($I_{1...n}$) and an output of one of the at least one device ($Q_{1...m}$) is input to device (12).

13. An analog to digital converter including the unit (100, 101, 200, 201, 301) of any the preceding claims.

14. A digital to digital converter including the unit (100, 101, 200, 201, 301) of claims 1-12.

15. The unit (100, 101, 200, 201, 301) of any of claims 1-12, wherein each of the m devices ($Q_{1...m}$) has different parameters set to improve stability, improve SNR, and/or reduce introduction of artifacts.

16. A method, comprising:

inputting a signal to n ($n \geq 1$) integrators ($I_{1...n}$) in series; and

quantizing when an absolute value of a signal input thereto is smaller and amplifying, with or without offset, when the absolute value of the signal input thereto is larger; and

quantizing an output.